Lake Tahoe Basin Framework Groundwater Study

USACE – Sacramento District &
Hydrologic Engineering Center

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www.spk.usace.army.mil/civ/tahoe/index.html

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of Engineers ®

Goals & Objectives

- Estimate nutrient loading (phosphorus and nitrogen) to Lake Tahoe via groundwater
- Determine known and potential nutrient sources
- Recommend potential nutrient reduction alternatives

Major Tasks

- Collect and compile groundwater data from various sources
- Compile data on current and past land use practices
- Develop alternatives for reducing the nutrient loading to Lake Tahoe through groundwater
- Determine nutrient loading estimates

Groundwater Data Collection

- Numerous agencies have been contacted to contribute data.
  - A majority of the data has been collected, but there are still gaps to be filled
  - A database is being updated continually as we collect the data
  - Information obtained from various agencies is being compiled to reduce duplicate wells

Current & Past Land Use Practices

- TRG land use categories are being used as a basis
- Aerial photographs from the late 60's and early 70's were obtained from the Forest Service and will be used to determine highly developed areas

Determine Nutrient Loading

- South Lake Tahoe data is currently being developed
  - Geology is currently being defined to determine "k" values
  - Pumping rates have been compiled
  - Groundwater levels are being compiled
- The northern portion of the lake will follow

Simulation of Surface Water- Groundwater Interaction, South Lake Tahoe CA

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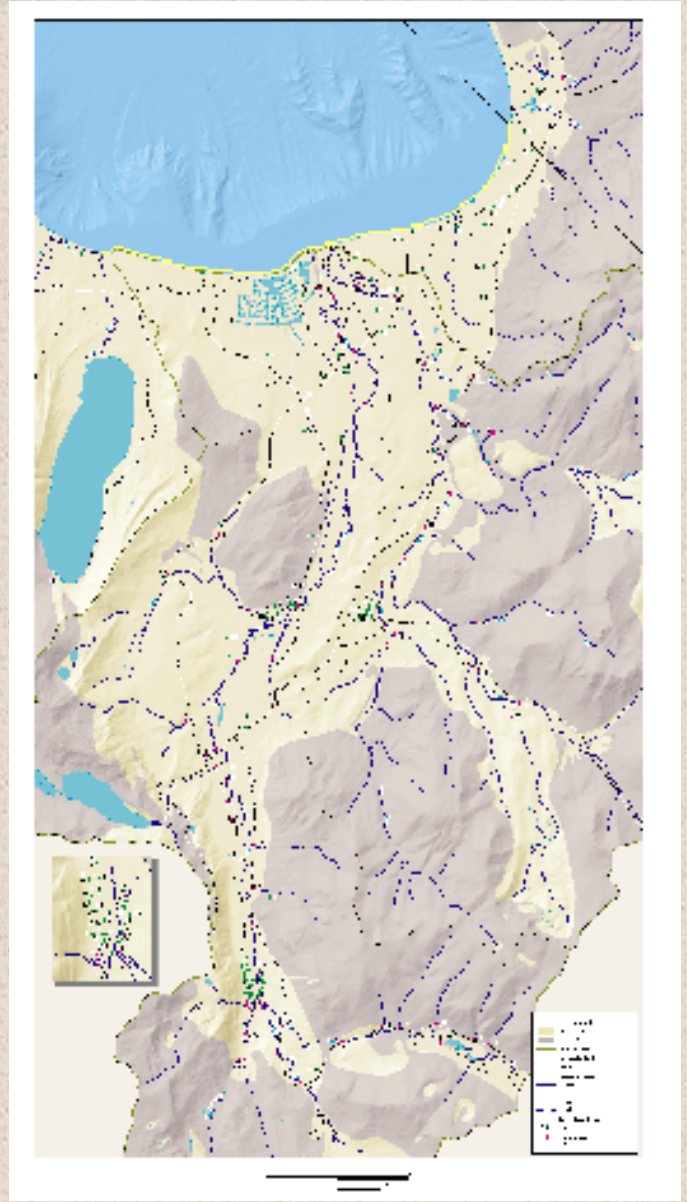
- Groundwater provides mechanism for transport of nutrients to lakes and streams
- Delineation of subsurface pathways will aid future remediation efforts and help guide planning decisions
- Water exchange between lake and adjacent groundwater at South Lake Tahoe is not well-understood

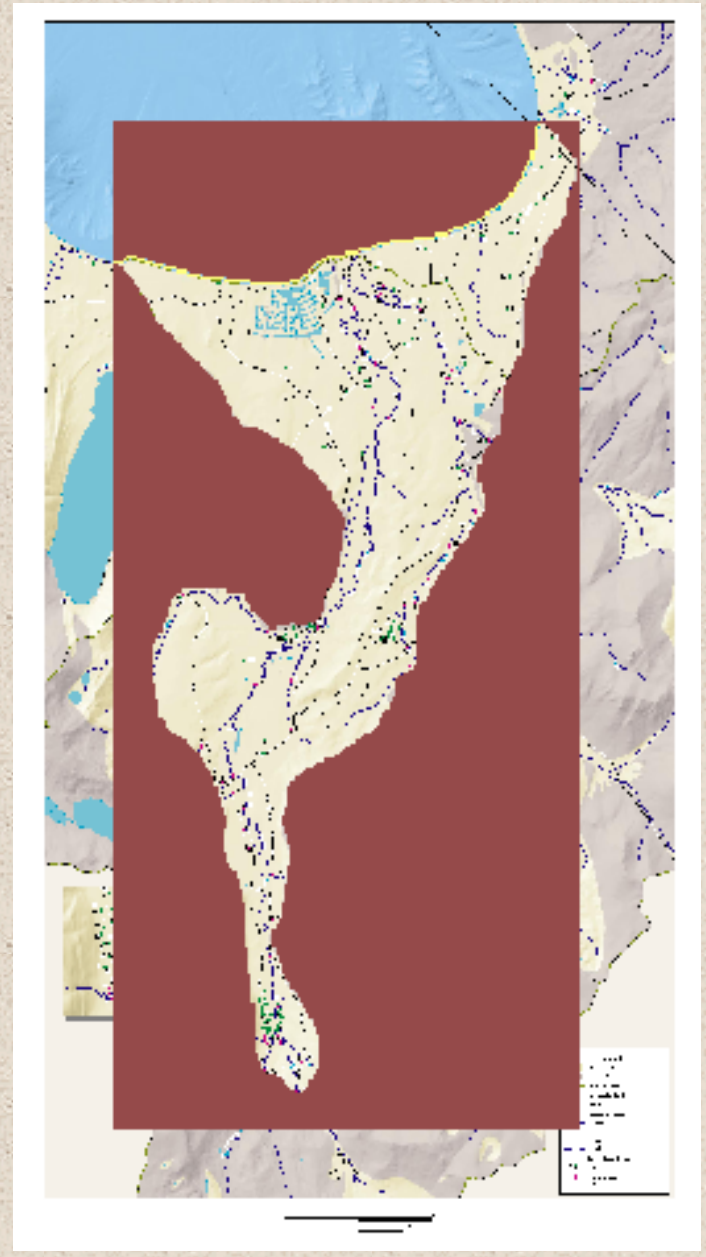
Model Objectives

- Estimate the volume, rate, and flow pathways of lake-groundwater interaction in the South Lake Tahoe area at specified locations and times.
- Delineate areas of potential groundwater recharge to lake in the South Lake Tahoe area under normal, wet, and dry climate scenarios
- Delineate areas of potential groundwater recharge to Upper Truckee River and Trout Creek
- Estimate effects of stresses (groundwater pumping, recharge etc) on the groundwater-surface water flow regime

Model Approach

- Integrate data from past studies including:
  - AGRA model
  - USGS stream flow measurements
- Extend model south to Christmas Valley
- 200 ft square cell size, 5-6 layers
- Model will be transient, calibrated to GW elevation and stream flow data from 1997-2002





Lake-Groundwater Interaction

- Model Domain will be divided into 3 areas
  - Pope Beach (UC Davis Study)
  - Tahoe Keys (Restoration Project)
  - Eastern area in the vicinity of Al Tahoe water supply well
- Estimates of the conductance term (which governs water exchange) will be made from data analysis and localized modeling

Stream-Groundwater Interaction

- Model will simulate stage, flows, and stream-aquifer interaction in Upper Truckee River and Trout Creek
- Model will be calibrated to measured stream flows from USGS study and gages
- Simple Stream flow routing algorithm (The MODFLOW STREAM Package) will be used

Products

- Maps delineating area of potential groundwater discharge to lake and streams under normal, wet, and dry climate scenarios
- Estimates of the volume of water exchange between the lake and groundwater seasonally and under varying climatic conditions
- Regional surface-groundwater model which can be a first step for use in future studies and site specific applications

Next Steps

- Compile data for the North Tahoe area
- Define Geology of North Tahoe
- Develop fertilizer to groundwater scenarios
- Develop nutrient reduction alternatives